PHASE II TECHNICAL REPORT

FINAL REPORT

LEVEL OF NEED FUNDED
MODEL FOR AREAS AND STATES
-
INDIAN HEALTH SERVICE

I&M Technologies Inc.
&
Center for Health Policy Studies

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EXECUTIVE SUMMARY

The Indian Health Service (IHS) calculates the Level of Need Funded (LNF) to assess adequacy of health care funding for the eligible American Indian and Alaska Native (AI/AN) population. LNF is the ratio of appropriated IHS funds to the funds needed by the eligible population for health care services. For example, a current year LNF ratio of 0.5 would indicate that appropriated dollars provided 50% of the health care services needed by the population.

This report presents a new approach to calculating LNF. Historically, LNF has been built up from IHS statistics on population, utilization, facilities, staffing, and costs. Indian Tribal Governments have been critical of the budget and cost driven approach taken to calculate LNF. As a result, Congress directed IHS to identify a technically acceptable method for estimating need in order to calculate the level of need funded. IHS organized an LNF Workgroup with representatives from all twelve IHS Areas, to guide the development of a new LNF methodology.

The LNF Workgroup selected parity with other Americans as an appropriate standard for calculating the need for health care services for the AI/AN population. This standard is summarized by a simple question:

> *What would it cost to provide a mainstream health insurance plan to the American Indian and Alaska Native population?*

Calculating LNF in this fashion requires actuarial analysis. Instead of analyzing budget and staffing for the current level of IHS services, the main task is to estimate what it should cost to provide this typical package of benefits. Analysis focuses on factors likely to affect cost of providing benefits, such as the health of the population (unhealthy populations need more health care), or the prices charged by physicians and hospitals (high cost areas need greater funding).

An earlier report using this standard estimated an LNF of 59 percent for IHS users as a whole (I&M/CHPS 1999).[1] That estimate was based on average cost of private insurance (including all premiums, copayments, and deductibles), adjusted for the age, health status, and rural location of the AI/AN population, net of estimated payments by other insurers (Medicare, Medicaid, and private).

This report repeats the actuarial approach to LNF separately for the 12 IHS Areas (regions) and for smaller geographic units within those regions. Estimated LNF for IHS Areas and smaller regions may be used as a guide for future allocation of funds across the IHS Areas.

Estimating LNF for IHS Areas is substantially more difficult than for the IHS as a whole because little information is available. The national LNF estimate could rely on detailed

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[1] The estimate was 54 percent when calculated for the somewhat larger IHS eligible population.

surveys such as the Survey of American Indians and Alaska Natives (SAIAN). No such detailed data are available for each of the 12 IHS areas. Instead, various proxy measures and estimates must be developed for the factors affecting costs and payments. The Area LNF estimates shown here, therefore, may be subject to error and should be used with caution. This report is best viewed as an initial attempt at an actuarial estimate of LNF for IHS Areas using currently available data.

Based on the analysis in this report, the Bemidji Area appears to have a consistently low LNF and Alaska a high LNF, under several alternative approaches to the calculation. The ranking for other areas changes based on the particular assumptions used in the analysis. The substantial uncertainties noted above mean that these rankings should be interpreted with caution.

Over the longer term, every part of this actuarial estimate could be substantially improved. First, estimated Medicare and Medicaid payments on behalf of this population are large but are not known with precision. A social-security-number-based match between IHS user rolls and Medicare and Medicaid data would give an accurate estimate of these key quantities. Second, projected health care prices used here may or may not reflect the price or cost per service actually paid by IHS and Tribal units. Analysis of IHS cost data and claims, or analysis of typical market rates for services, might provide a better estimate of actual incurred cost per service. Third, the health status proxy used here reflects only a few factors linked to health. More accurate Area-level measures of health status could be developed either using diagnoses reported on claims and encounter data, or from surveys of the AI/AN population. Fourth, uncertainty in the count of users directly affects LNF because the actuarial method sets a per-capita spending amount. IHS data on users and services should be examined for possible Area variations in the quantity and mix of services that qualify an individual as a user. Finally, variations in factors affecting efficiency of service require further investigation. In particular, service costs in the most remote areas might be examined separately from the remainder of IHS/Tribal service delivery.

In the next section, an overview of methods and results is presented. The subsequent section provides detail on each of the factors used in the analysis, along with significant caveats and suggestions for future research. The final section provides a guide to detailed data available in a spreadsheet that accompanies this report.

§1. BACKGROUND

The Indian Health Service budget provides a comprehensive system of health care that includes personal health care services, sanitation, facilities, disease prevention, and public health services for the eligible AI/AN population. The current IHS appropriation is approximately $2.1 billion. In addition, the budget is supplemented by about $0.3 billion in collections from Medicaid, Medicare, and private insurers, for services delivered in IHS facilities to insured individuals. In 1995, the population eligible to use IHS care was about 1.5 million individuals. Nearly 1.3 million actually received IHS care during a prior three-year period (IHS 1997a, IHS 1997b).

The Indian Health Service periodically estimates the amount of money needed to serve the health care needs of the AI/AN population in each Area. The level of need estimated is then compared to the amount of funds available. Together they form a ratio known as the *Level of Need Funded* (LNF). An LNF of 50 percent, for example, means that IHS funding is half of the amount needed to cover the health care needs of the AI/AN population.

Historically, IHS has determined the LNF by examining its own statistics on staffing, facilities, population, use, and costs. Norms for physicians or hospital beds per capita were translated into overall required levels of spending. The three most recent estimates of LNF were 66.5%, 55.6%, and 46.9% using data from 1993, 1994, and 1996 respectively (IHS 1998a). These estimates were made at a time when IHS spending in real, inflation-adjusted terms was nearly constant; yet the covered population was growing by about 2 percent per year (IHS 1997b).

The historical approach to LNF was criticized for being difficult to understand; not subject to independent verification; and too reflective of use, as opposed to need for care. Few outside IHS had the expertise to understand the methods and the underlying data. LNF became a "black box" to the Congress and to the Tribes.

Recognizing these shortcomings, Congress directed IHS to find a better and more acceptable method. IHS set a goal to develop a technically accurate and objectively defensible methodology for estimating the Level of Need Funded. IHS assembled an LNF Workgroup, with representation from each of the 12 IHS Areas. The Workgroup determined that the most reasonable standard for AI/AN health care was comparability with other Americans. In a practical sense, the Workgroup saw the LNF as answering a simple question*: What would it cost to give the AI/AN population a typical, mainstream health insurance plan?* This new approach to the LNF replaced the internal, budget driven methods with an external, market driven standard - private health care costs.

IHS contracted with I&M Technologies Inc. (I&M) and the Center for Health Policy Studies (CHPS) to assist the LNF Workgroup to answer the question of comparability. Mindful of the deficiencies in the older LNF cost model, the LNF Workgroup focused on developing an LNF estimate that would:

- Rely on publicly-available data sources;
- Use industry-standard methods;
- Tie to a typical or standard level of benefits; and
- Be easily understood.

I&M/CHPS adopted an actuarial approach to estimating LNF. This meant starting from the health care premium typically charged to provide a standard set of benefits, then adjusting for factors likely to affect spending. For example, a high prevalence of disease in the covered population would raise predicted health care costs, while residence in low-cost rural areas would reduce predicted costs.

The first report using this method focused on LNF for the IHS as a whole (I&M/CHPS 1999). Providing the IHS user population with coverage equal to federal employees' health coverage was estimated to cost $2,980 per person, including the total cost of premium, co-payments, and deductibles. This figure was reduced 25 percent to account for estimated coverage by other insurers (Medicaid, Medicare, and private). IHS funding per user for personal health care services was 59 percent of this reduced amount, so estimated LNF for the IHS user population was 59 percent. Calculation of LNF under varying actuarial assumptions demonstrated that LNF was substantially less than 1.0 under many plausible alternative scenarios.

This report takes this actuarial approach to LNF and applies it to the 12 IHS Areas. The more detailed LNF calculation is required to help determine the distribution of possible equity funds across the Areas.

Estimating LNF for these smaller regions is substantially more difficult than estimating LNF for the IHS as a whole. The main problem is that little information is available. While the national LNF estimate could rely on some national surveys such as the Survey of American Indians and Alaska Natives (SAIAN), no such survey data are available for each of the 12 IHS areas or reservation States. For each of the factor affecting costs and payments, various proxy measures and estimates must be submitted in place or more direct (and accurate) data.

Accordingly, this report serves three purposes. First, it provides an LNF calculation for IHS Areas based on the best data currently available. Second, because Area-level data are so uncertain, it provides a range of estimates based on blending of Area and National data. Finally, it identifies weakness in the current method and, where possible, suggests alternative approaches to be used in the future.

§2. METHODS AND FINDINGS – LNF FOR 12 IHS AREAS

This section presents a brief overview of the methods and results for the actuarial model of LNF for Areas. Sufficient detail is presented to allow readers to follow the flow of the calculation. Discussion of the details -- data and methods, and important limitations and caveats -- is presented in Section 3.

§2.1 Overview of Actuarial Calculation

In broad outline, the actuarial approach to estimating LNF involves answering three questions:

1. What would it cost to give the AI/AN population a mainstream health insurance plan, such as the ones offered to federal employees? The predicted cost of providing this package of benefits is the total or overall need for health care funding.
2. How much of that cost is already being paid by other insurance coverage, such as Medicare, Medicaid, and private health insurance? Subtracting this from overall need gives the net need for IHS funding.
3. How well does IHS funding cover that net need? LNF is the ratio of IHS funding (for personal health care services only) to net need for IHS funding.

The prior report estimated these factors for the entire IHS user and eligible populations (I&M/CHPS 1999). The prior work estimated overall need at $2,980 per person, with other insurance coverage estimated to pay roughly 25 percent of that need. That left $2,235 per person in federal funds needed to provide free mainstream health coverage to the AI/AN population (Table 2-1). IHS funding per user for personal health care services amounted to $1,310, leading to a national LNF of 59 percent ($1,310/$2,235).[2]

Table 2-1: Outline of National LNF Calculation

Estimated total cost of mainstream benefits	$2,980
Costs paid by other insurers	$745
Net need for IHS funds (A)	$2,235
IHS personal health care funding per user (B)	$1,310
LNF (B as percent of A)	59%

The current task is to repeat this calculation for each of the 12 IHS Areas. The analysis starts from the baseline figure of $2,980 per capita, and then adjusts for variation across Areas in factors that may affect costs, insurance coverage, and IHS budget.

The simplest approach to LNF for each Area would assume each Area is identical to the IHS average. Under that approach, Area LNF would simply be Area IHS funding per capita for personal health care services, divided by $2,235 (Table 2-1). Areas with the lowest IHS funding per capita would have lowest LNF.

[2] As discussed below, these estimates are for the IHS User population.

The simple approach would do no more than mirror differences in per-capita IHS funding. That ignores many factors that may have a strong impact on LNF in each area. For example, the cost of providing care in Alaska is substantially higher than elsewhere in the U.S. due to the high cost-of-living factor for Alaska. Less obviously, other items such as generosity of state Medicaid programs and population health status may vary substantially across Areas.

This analysis starts with the national average data as the default, and then modifies that with Area specific data. For example, the national average would be moved up or down depending on the apparent health status of the AI/AN population in each area. At the end of the calculation, various blends of national- and area-specific data show how the LNF ranking depends on the data.

§2.2 Estimated Cost of Mainstream Health Benefit Package

The basic actuarial identity for cost of health care is that cost is the product of the number of services and the average cost per service. In this analysis, three factors were identified that would be expected to affect the number (and intensity) of services or the cost per service in each area. For each factor, an index was calculated that compares each region to the IHS average. A final "budget-neutrality" adjustment was imposed to ensure that predicted cost of providing benefits (after these adjustments) remains at $2,980.

Population health status. First, population health status affects the predicted volume and intensity of services needed to provide the standard package of benefits. A population in poorer-than-average health will require more care. For example, a population with higher mortality rates and lower life expectancy probably requires more health care services per person.

For this analysis, no detailed data were available to construct a direct measure of burden of illness for each Area's population. For example, data on the number of individuals with specific diseases and disabilities would have given a very direct measure of health status. IHS data systems can supply person-level diagnosis information (as reported on encounter forms and bills), but this information is not complete and consistent for all IHS and Tribal sites. Instead, rates of birth, poverty, and death were used to construct a proxy for population health status. These proxies for health status were combined to give a numerical index that compares each Area to the IHS average. Detail on methods and significant caveats are given in section 3.1.

Price of health care. Second, local prices for health care services will obviously affect the average cost per service. Areas with high costs for physician visits and hospital stays will require more money to provide the standard package of benefits.

For this analysis, an index of health care costs was calculated from the data that that Medicare program uses to set hospital and physician payments. These data reflect average hospital wages in individual metropolitan statistical areas, plus a wage rate reflecting the rural areas in each state. These hospital wage data were blended with information physicians' practice costs to arrive at an index for health care costs.

This analysis assumes that care would be purchased, and that variation in market rates reflects variation in underlying costs. In fact, when delivered through the IHS/Tribal systems, that probably is not true. See section 3.2 for details of the calculation and discussion of significant caveats.

System efficiency. Third, the efficiency of the IHS/Tribal delivery system will affect the predicted average cost per service. Some IHS/Tribal delivery system consists of smaller-than-average units, unable to take advantage of "economies of scale." The inherent inefficiency of small-scale health care systems raises the cost of providing each service.

IHS Staff has used a formula to adjust for differences in size of service units, as measured by total user count. The formula would allow slightly higher funding levels for Areas with many small service units, and slightly lower funding levels for Areas with larger units. See section 3.M for details and significant caveats.

Use of this efficiency factor alters the underlying actuarial model somewhat. In theory, the model is based on the cost of purchasing private health insurance. In practice, incremental dollars allocated with this model will be used to provide care through the IHS/Tribal system, not to purchase health insurance. Adjusting for variations in efficiency across IHS/Tribal sites gives a more accurate estimate of the impact of small changes in spending. If the full funding gap were made up at once, different assumptions might apply because the delivery system would change significantly**.**

Budget neutrality. Finally, each step of the calculation and the final results were adjusted so that that average cost of benefits remains $2,980. Many of these factors had already been included in the initial estimate of $2,980. (For example, that figure already reflects a 6 percent reduction for low costs in rural areas.) A budget neutrality adjustment is required to avoid double-counting any of these factors, and to ensure that $2,980 in benefits costs remains the basis for the rest of the calculation.

Results and Blending with National Data. These three factors can be combined to estimate the cost of providing the mainstream benefit package in each area. Tables 2-2 and 2-3 show various blends of Area and national data.

Table 2-2 shows predicted cost of the mainstream benefits package based on estimated Area factors for population health, price of health care, and system efficiency. These estimates illustrate how the model works and how the various factors affect predicted costs. Given the uncertainty in the underlying data and assumptions used, the results should be interpreted with caution.
The estimated population health status index ranges from 8 percent healthier than average in California (index value of 0.92) to 8 percent less health than average in Aberdeen. The price index has a substantially larger range, from 37 percent above the IHS average in Alaska to 14 percent below the IHS average in Aberdeen. The system efficiency factor

ranges from the very small service units in California and Nashville (estimated to cost about 9 percent more than average) to the large and relatively efficient units of Navaho and Oklahoma (estimated to cost 4 to 5 percent less than average).

Predicted cost for each area demonstrates how each of these factors affects the total. For Alaska, predicted cost exceeds $4,000. That figure is dominated by the very high price per service in Alaska, matching the high cost of living there. Predicted cost for the rest of the country reflects the mix of factors applying to each area. California has the highest predicted costs ($3,500). On the one hand, good health status in California would suggest lower costs there. This is more than offset, however, by the combined effect of high health care prices in that area and an inefficient delivery system composed of many small operating units. At the other extreme, Oklahoma has the lowest predicted costs. Not only is health status relatively good (compared to other IHS Areas), but health care prices for that area are estimated to be relatively low, and the area has a relatively efficient system composed of large service units. These factors (good health, low health care prices, efficient delivery system) combine to produce a low overall expected cost.

As noted above, the particular estimate for any area should be interpreted with caution. In general, this table illustrates the general principles of this approach. The particular numerical estimate of the factors for any area could substantially in error. In general, areas with poorer health, higher health care prices, and inefficient delivery systems will be estimated to have higher costs. The net effect for any area will reflect the balance of these three factors.

Table 2-2: Predicted Cost of Mainstream Benefits Using Area Data

Pct. Weight for Area Data→		100%	100%	100%	
Area	National Cost of Benefit Package	Health Status Index	Health Care Price Index	System Efficiency Factor	Area Cost of Benefit Package
ABERDEEN	$2,980	1.08	0.86	1.035	2,870
ALASKA	$2,980	0.99	1.37	1.001	4,060
ALBUQUERQUE	$2,980	0.98	0.95	1.006	2,800
BEMIDJI	$2,980	1.06	1.00	1.038	3,270
BILLINGS	$2,980	1.04	0.95	1.036	3,030
CALIFORNIA	$2,980	0.92	1.17	1.089	3,500
NASHVILLE	$2,980	0.96	0.99	1.087	3,090
NAVAJO	$2,980	1.02	0.95	0.960	2,760
OKLAHOMA	$2,980	0.97	0.87	0.952	2,400
PHOENIX	$2,980	1.01	1.04	0.994	3,110
PORTLAND	$2,980	0.97	1.14	1.055	3,460
TUCSON	$2,980	1.05	1.02	1.012	3,220
Average					2,990

The estimates of Table 2-2 are based on data known to be somewhat uncertain. Yet, each Area's estimate is based entirely on that Area's data as reported. With that approach, any errors in the underlying data are fully translated into dollar-for-dollar variations in the Area estimate of the cost of the benefit package.

A more conservative way to use uncertain information is to weight each factor in proportion to its estimated reliability. This allows each factor to enter only partially into the model based on judgments about the quality of the underlying data (Table 2-3). Under this approach, Areas are assumed to be identical along each of these factors, unless there is some confidence that a factor truly captures area-level differences. This sets an explicit "default" value for each factor: In the absence of good information, Areas are assumed to be identical to the average. The better the Area-level information, the more each factor is allowed to diverge from average, with the importance of the Area-level data based on expert opinion of its reliability.

For example, the LNF Workgroup agreed that health care prices are high in Alaska. They found, however, that the health care price index did not convincingly capture price variations among other areas. The index data reflect nursing wages and other input costs, not the actual prices paid per service (for example, actual physicians' fees or hospital per-diem rates). This proxy was judged useful only for capturing the gross difference between Alaska and other areas. Based on that judgment, the calculation of Table 3 assumes that all areas other than Alaska face equal health care prices. (In the future, as more reliable price data are obtained, Area-level factors for prices could be substituted into the calculation.)

After examining the data, the LNF Workgroup reached three conclusions regarding reliability. They judged that the price data were unreliable (other than for Alaska) and that substantial new information is required for accurate price adjustment. They judged that the health status proxy index was reasonable but not based on sufficiently detailed data to be fully reliable. Finally, they judged that the efficiency adjustment, which is based on long-standing IHS practice, was sufficiently reliable and tested to be used in full.[3]

Blending Area and national data in proportion to estimated reliability of the data gives a much more compressed range of predicted costs (Table 2-3). Outside of Alaska, only about $400 separates the most and least costly areas, compared to the $900 range shown in the previous table. That occurs because all Areas (other than Alaska) are assumed to face the same health care prices, eliminate the impact of price variation on estimated costs. Outside Alaska, areas with the highest predicted costs are those estimated to have poor health status and inefficient delivery systems (Aberdeen, Bemidji). The lowest-cost area combines good estimated health and efficient delivery system (Oklahoma).[4]

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[3]See Section 3 for a more complete discussion of these factors and some significant exceptions to the summary statements presented here.

[4] This is similar to but not identical to the final recommendations of the LNF Workgroup. At the 8/24-8/25 meeting of that Workgroup, the decision was made to use 100 percent of the efficiency index, half of the health status proxy index, and to modify the price index to reflect the mix of direct and contract care and to provide a better estimate (if possible) of prices actually paid for contract health care services.

Table 2-3: Predicted Cost of Benefits, Mixing National and Area Data

Pct. Use of Area Data→		50%	0%	100%	
Area	National Cost of Benefit Package	Health Status Index	Health Care Price Index	System Efficiency Factor	Area Cost of Benefit Package
ABERDEEN	$2,980	1.04	0.97	1.035	$3,100
ALASKA	$2,980	0.99	1.37	1.001	$4,080
ALBUQUERQUE	$2,980	0.99	0.97	1.006	$2,870
BEMIDJI	$2,980	1.03	0.97	1.038	$3,070
BILLINGS	$2,980	1.02	0.97	1.036	$3,040
CALIFORNIA	$2,980	0.96	0.97	1.089	$3,010
NASHVILLE	$2,980	0.98	0.97	1.087	$3,060
NAVAJO	$2,980	1.01	0.97	0.960	$2,790
OKLAHOMA	$2,980	0.98	0.97	0.952	$2,690
PHOENIX	$2,980	1.00	0.97	0.994	$2,870
PORTLAND	$2,980	0.99	0.97	1.055	$2,990
TUCSON	$2,980	1.02	0.97	1.012	$2,980
Average					$2,980

§2.3 Other Insurance Coverage and Payments by Other Payers.

The actuarial calculation of LNF must account for all sources and uses of funds. In particular, coverage by other insurers may pay for part of the estimated cost of the mainstream benefits package. Obtaining data on that spending, however, is quite difficult and little reliable information was found. This remains one of the most problematical parts of the analysis, and the reader should refer to the substantial caveats in Section 3.4 before using any of the numbers presented here.

The inclusion of other coverage by other insurers involves issues of legality and principle not addressed in this report. The LNF Workgroup is considering estimates of LNF with and without such coverage, and the report from that Workgroup is the proper place to address those issues. From the standpoint of an actuarial calculation, those coverages must be included, and this report focuses solely on the technical aspects of estimating payments by Medicare, Medicaid and private insurers on behalf of the IHS user population.

More than anywhere else in this report, data presented in this section should be used with caution. Very little reliable information was available for calculation. Medicaid programs publish some aggregate data based on AI/AN race that may or may not reflect costs for the IHS user population. No Medicare program data were available specifically for the AI/AN population. No private insurance data of any type were available. As a consequence, these numbers are based on a series of assumptions and extrapolations combining national survey data and limited State-level data. For Medicaid, in particular, LNF Workgroup members identified an important underlying assumption that was demonstrably incorrect for one large state, and may be affect estimates for other states as well. The reader should examine Section 3.4 before using any of the numbers presented here.

IHS reports collections from these payers, payments to IHS for services provided in IHS facilities. For two reasons, however, the IHS collections data are not adequate for this analysis. First, payments by insurers include both *collections* (for services provided in IHS/Tribal facilities) and *cost-avoidance* (services provided and paid for entirely outside the IHS system). Second, collections data are only reported for IHS direct care, and are not reported for tribal-run systems.

The LNF Workgroup judged these estimates of funding from other insurance to be insufficiently accurate for use in the LNF formula. Instead, for final LNF calculations, national average data will be used with upward adjustment for Alaska to account for high cost-of-living there.

Medicaid. Medicaid is the largest source of additional coverage for the IHS User population. Medicaid programs submit annual summary data known as 2082 reports, showing the number of eligible individuals and spending by race. In principle, those state data provide a ready basis for estimating Medicaid payments for the AI/AN population. In practice, numerous adjustments are required to account for missing data, for services potentially outside the benefits package (such as nursing home and other forms of long-term care), and similar issues. Counts of AI/AN Medicaid enrollees appear potentially understated in areas such as California, but overstated elsewhere. In addition, some state Medicaid program rules may prevent a substantial fraction of the AI/AN eligible from using IHS/Tribal services. Discussion of these and other caveats is provided in section 3.3 below.

For this analysis, two methods for estimating Medicaid spending were tried, and then averaged to give a final "split the difference" estimate. The first estimate used Medicaid 2082 data as reported, with minimal adjustments for missing information. The second estimate removed state-average costs associated with long term care and other services not in the benefits package, and assumed that AI/AN Medicaid enrollment was proportion to AI/AN poverty rates. These two approaches often produced widely different estimates of per-capita spending at the state level.

Medicare. No useable detailed data for Medicare AI/AN coverage or spending were available. Race coding on Medicare administrative data reflects race as reported by Social Security, and AI/AN race category was added only after 1981. Analysis of counties with high AI/AN Medicare enrollment suggests that Medicare spending per AI/AN is roughly similar to Medicare spending for all elderly.

For this analysis, 1.1 percent of the under-65 population and 84 percent of the over-65 population were assumed enrolled in Medicare, based on coverage reported in SAIAN. Medicare average per-capita payments in each county were multiplied by estimated AI/AN enrollment in each county to get total Medicare payments. See section 3.3 for details and caveats.

Private Payers. No data are available on private insurance coverage for the IHS user population. Estimated private payments were based on the average relationship between employment, poverty, income, Medicaid and private health insurance. SAIAN was used to estimate the average impact of these factors on ownership of private insurance, and then Census and Medicaid data were used to provide an estimate of private health insurance coverage in each county.

Results. This approach results in a somewhat higher overall estimate of payments by Medicaid, Medicare, and private insurance than was assumed in the initial report. Based on this method, estimated total payments average nearly $1,100, versus the assumption of $745 in payments used in the prior report. Some potential reasons for this discrepancy are discussed in Section 3.3.

This method gives very wide variation in reported Medicaid payments, but somewhat lower percentage variation in reported total payments. Total estimated payments for Alaska are roughly in proportion to the cost-of-living difference between Alaska and the remainder of the country. The remaining variation is driven primarily by variation in estimated Medicaid payments, with Portland showing highest total payments and California and Oklahoma showing lowest.

Table 2-4: Estimated Payments by Other Insurers

Pct. Use of Area Data→	100%	100%	100%	
Area	Medi-Caid Pmts	Medi-Care Pmts	Priv-ate Pmts	Total
ABERDEEN	$831	$213	$129	$1,174
ALASKA	$949	$231	$352	$1,532
ALBUQUERQUE	$477	$235	$219	$930
BEMIDJI	$567	$235	$233	$1,035
BILLINGS	$676	$217	$180	$1,074
CALIFORNIA	$200	$334	$381	$914
NASHVILLE	$388	$314	$332	$1,033
NAVAJO	$722	$220	$103	$1,045
OKLAHOMA	$259	$380	$273	$913
PHOENIX	$533	$251	$236	$1,021
PORTLAND	$760	$226	$343	$1,328
TUCSON	$639	$317	$150	$1,106
Average	$562	$272	$236	$1,071

§2.4 IHS Budget per User and Estimated LNF

On a national average basis, IHS staff estimate that about 17 percent of all funding is for services other than personal health care. This estimate was based on review of line items in the IHS budget, weighting each line item by the estimated overlap with a defined package of personal health care benefits. Dividing total spending in each area by estimated count of IHS users gives per-capita spending.[5]

Results and Estimates of LNF. As noted above, estimating an LNF is subject to many caveats. In general, the LNF Workgroup reviewed this work and noted serious concerns about accuracy and appropriateness of the underlying data. None of the factors included in this analysis is based on a direct measurement of the characteristics of the IHS user population. Instead, the LNF estimate presented here is based on data that are currently available. A variety of assumptions, proxy measures, and imputed data are used to arrive at the LNF estimate. Any conclusions from this analysis, therefore, should be tentative and are clearly subject to substantial revision when a more refined method is adopted.

Numbers presented here do not reflect the final judgements of the LNF Workgroup for this round of analysis. The Workgroup identified several areas for immediate refinement, including analysis of Area prices based on the proportion of direct versus contract care in each area, exclusion of patient transportation costs from Alaska, and calculation of LNF for individual Service Units rather than Areas. In particular, the requirement to calculate LNF at the service unit means that the Area-average data here will not reflect the within-Area variation in LNF, with some Units having high and low LNF within each Area. IHS staff will use the updated data when it becomes available. This is likely to result in modest changes in LNF for most Areas, and potentially substantial changes in LNF for Alaska.

Two estimates of LNF are presented below. In the first (Table 2-5), all the estimated Area factors are used for the calculation. This results in very wide variation in estimated LNF, from 47 percent in Bemidji to 108 percent in Alaska. A second approach moderates some of the variation by blending local and national-average data (Table 2-6). For the second set of estimates, variation in other insurance coverage and health care prices (other than for Alaska) is ignored, and only half the variation in the health status index is included. (This reflects the LNF Workgroup's judgement regarding the reliability of these factors.) This increases the reliance on variation in IHS funding per user as the major determinant of LNF. In this second analysis, Alaska still has the highest LNF at 91 percent, while Oklahoma, Bemidji and Navaho have the lowest LNFs, ranging from 51 to 55 percent.

Under either approach, Alaska is ranked at the top of the list, and Bemidji is ranked at or near the bottom. Rankings for other areas depend to a greater or lesser degree on which data elements are included in the estimate.

[5] This is the only portion of the calculation that relies on the user count data in any significant way. Issues around use of these count data are discussed in Section 3.6.

Table 2-5: Level of Need Funded Estimate Using all Area Data

Percent Use of Area Data→			100%	100%	100%		100%			
Area	Users (est. 1999)	National Cost of Benefit Package	Health Status Index	Health Care Cost Index	System Efficiency Factor	Area Cost of Benefit Package	Tot Pmts Medicaid, Medicare, Private	Need for IHS Funds	IHS Budget Per User	Level of Need Funded
ABERDEEN	104,695	$2,980	1.08	0.86	1.035	$2,870	$1,174	$1,695	$1,438	85%
ALASKA	109,658	$2,980	0.99	1.37	1.001	$4,060	$1,532	$2,524	$2,734	108%
ALBUQUERQUE	83,266	$2,980	0.98	0.95	1.006	$2,800	$930	$1,874	$1,096	58%
BEMIDJI	82,889	$2,980	1.06	1.00	1.038	$3,270	$1,035	$2,232	$1,057	47%
BILLINGS	66,307	$2,980	1.04	0.95	1.036	$3,030	$1,074	$1,960	$1,529	78%
CALIFORNIA	65,529	$2,980	0.92	1.17	1.089	$3,500	$914	$2,586	$1,360	53%
NASHVILLE	39,998	$2,980	0.96	0.99	1.087	$3,090	$1,033	$2,053	$1,674	82%
NAVAJO	204,641	$2,980	1.02	0.95	0.960	$2,760	$1,045	$1,720	$950	55%
OKLAHOMA	290,946	$2,980	0.97	0.87	0.952	$2,400	$913	$1,485	$827	56%
PHOENIX	125,291	$2,980	1.01	1.04	0.994	$3,110	$1,021	$2,090	$1,222	58%
PORTLAND	85,952	$2,980	0.97	1.14	1.055	$3,460	$1,328	$2,135	$1,538	72%
TUCSON	21,699	$2,980	1.05	1.02	1.012	$3,220	$1,106	$2,113	$1,315	62%

Table 2-6: Level of Need Funded Estimate Mixing Area and National Data

Percent Use of Area Data→			50%	0%	100%		0%			
Area	Users (est. 1999)	National Cost of Benefit Package	Health Status Index	Health Care Cost Index	System Efficiency Factor	Area Cost of Benefit Package	Tot Pmts Medicaid, Medicare, Private	Need for IHS Funds	IHS Budget Per User	Level of Need Funded
ABERDEEN	104,695	$2,980	1.04	0.97	1.035	$3,100	$1,071	$2,027	$1,438	71%
ALASKA	109,658	$2,980	0.99	1.37	1.001	$4,080	$1,071	$3,006	$2,734	91%
ALBUQUERQUE	83,266	$2,980	0.99	0.97	1.006	$2,870	$1,071	$1,795	$1,096	61%
BEMIDJI	82,889	$2,980	1.03	0.97	1.038	$3,070	$1,071	$1,997	$1,057	53%
BILLINGS	66,307	$2,980	1.02	0.97	1.036	$3,040	$1,071	$1,967	$1,529	78%
CALIFORNIA	65,529	$2,980	0.96	0.97	1.089	$3,010	$1,071	$1,940	$1,360	70%
NASHVILLE	39,998	$2,980	0.98	0.97	1.087	$3,060	$1,071	$1,993	$1,674	84%
NAVAJO	204,641	$2,980	1.01	0.97	0.960	$2,790	$1,071	$1,716	$950	55%
OKLAHOMA	290,946	$2,980	0.98	0.97	0.952	$2,690	$1,071	$1,621	$827	51%
PHOENIX	125,291	$2,980	1.00	0.97	0.994	$2,870	$1,071	$1,795	$1,222	68%
PORTLAND	85,952	$2,980	0.99	0.97	1.055	$2,990	$1,071	$1,918	$1,538	80%
TUCSON	21,699	$2,980	1.02	0.97	1.012	$2,980	$1,071	$1,907	$1,315	69%

§3. DETAIL ON DATA AND METHODS FOR LNF CALCULATION

This section presents detail on data and methods used to calculate the LNF. In each case, notes on the approach and data are presented first, followed by discussion of significant caveats and suggestions for better measures or additional research.

§3.1 Population Health Status

Methods. The prior report on national LNF relied on a very rich source of data -- the Survey of American Indians and Alaska Natives (SAIAN) -- to create the health status adjustment for the national LNF. SAIAN contained highly detailed health status data, including questions about dozens of diseases and conditions, as well as information on disability, self-perceived health status, and factors such as smoking and diet. As described in that report, the health status data were combined to give a prediction of the costs each individual was likely to incur under typical private health insurance coverage.

An alternative method commonly used for health status adjustment by insurers relies on diagnosis data reported on health care claims or encounter data. Medicare and some Medicaid programs, for example, are currently collecting encounter data from managed care plans so that diagnoses can be used to set payment rates adjusted for the health status of each managed care plan's enrolled population. Populations that show higher rates of disease (based on diagnoses reported on the encounter data) will have higher capitation rates.

Neither of these sources of detailed data -- survey of health status or diagnosis data from claims or encounter forms -- was available for this work. For survey data, no recent health status surveys include any large number of AI/AN individuals, and none of the existing surveys including SAIAN was designed to estimate health status for the individual IHS Areas or service units.[6]

This analysis therefore had to rely on proxies for health status that could be readily obtained for the IHS eligible or user populations. This includes race-based information available from the U.S. Census, vital statistics (births and deaths) data gathered by the National Center for Health Statistics. These potential health status proxies include:

- Age and sex (IHS patient registry data, 1995-1997)
- Death rate (adjusted for miscoding of race, NCHS 1994-1996)
- Birth rate (NCHS, 1994 to 1996)
- Poverty (1990 Census)
- Infant mortality (adjusted for miscoding of race, NCHS 1994-1996)

[6] For example, the Medical Expenditures Panel Survey (MEPS) currently has fewer than 20 individuals of AI/AN race in the panel, and the Current Beneficiary Survey (CBS) for Medicare has fewer than 10. These are nearly proportional to AI/AN representation within the overall population, given the sample sizes for these surveys.

Not all of these factors could or should be used. First, infant mortality is a fairly rare event, and estimated numbers of infant deaths appeared unstable when assessed for the individual IHS Areas. Further, no infant deaths appear in the entire 6,000-person sample in SAIAN, so there was no consistent way to develop an estimate for the impact of infant mortality on costs.

Second, the use of an age adjusted was rejected because it was probably not appropriate in this case. Standard age-sex adjustment is an appropriate technique when a single population makes a one-point-in-time choice between health plans. There, a plan with younger enrollees is expected to have lower cost per year, while one with older enrollees should have higher costs. In particular, age and mortality rate should be positively related. A plan attracting younger individuals should have few deaths, while one attracting older individuals should have more deaths.

In this case, however, the age of the Area population is not the result of choice, but is largely a result of health status. Age and mortality are inversely connected. Population in Aberdeen is younger, in large part, because individuals there die at a lower age than elsewhere. For the elderly, at least, longer lifetime is associated with only modestly higher lifetime healthcare costs and substantially lower health care cost per year of life ((Lubitz et al. 1995). Given the choice between including age-sex adjustment (and thereby reducing projected payments in areas with shorter lifespan) and excluding age-sex adjustment, on balance it appeared that ignoring age differences among Area populations was a more reasonable approach to the health status adjustment.

The remaining factors (births, poverty, deaths) provide the basis for a proxy index of health status. Births are important because a substantial proportion of IHS spending is for maternity-related care. Roughly one-sixth of all IHS-paid hospitalizations were for deliveries (IHS 1997). Deaths and death rate should be correlated with overall burden of illness within the community. That is, communities with a high death rate probably have a high proportion of individuals with illnesses placing them in the last years of life. Finally, high poverty rates are generally associated with poor health status through a variety of mechanisms, including nutrition, substance abuse, and lack of adequate resources to purchase health care.

Creating the proxy index for health status requires finding dollar weights to capture the impact of birth rate, poverty rate, and mortality rate on health care spending. The weights for each factor were calculated from SAIAN, and then applied to Census and vital statistics data for each Area. First, 1987 SAIAN and National Medical Expenditures Survey (NMES) data were used to construct a detailed health status measure for each AI/AN individual. This was the predicted health care cost for the individual, based on a spectrum of disease and conditions reported for each individual in SAIAN. (Methods for this were described in prior LNF report). Second, births, deaths, poverty status and predicted cost were averaged for each of the communities (strata) in the SAIAN survey. Third, regressions were run to link average birth, poverty, and death rates in the community to average predicted health care costs there. This regression gives the dollar weights for births, poverty, and deaths. Finally, these weights were applied to Census and vital statistics data in each area, and the resulting index was rescaled to make a budget-neutral comparison of health status across all IHS Areas.

The regression coefficients (weights) for the three parts of the index (births, deaths, and poverty) are difficult to interpret. Instead, Table 3-1 shows the net impact of each factor on the overall, budget-neutral index. (The index created here compares the IHS areas to one another, not to the remainder of the U.S. population, so the overall impact must be adjusted to keep total spending at $2,980.) The columns labeled "Net Impact on Index" reflect both the Area rate and the weight each component has in the index. The Areas show considerable variation. Aberdeen, Bemidji and Billings score above zero on all three components of the index, indicating poorer expected health status. California, Nashville, Oklahoma and Portland score at or below zero on all three components. The remaining Areas have a mix of positive and negative scores.[7]

Table 3-1: Impact of Births, Deaths, and Poverty in Health Status Index

	Average Rate for Area			Overall Impact on Index			Health
Area	Death Rate NCHS 94-96	Birth Rate NCHS 94-96	Poverty Rate Census 1990	Death Rate NCHS 94-96	Birth Rate NCHS 94-96	Poverty Rate Census 1990	Status Index (Percent)
ABERDEEN	0.8%	2.8%	54.5%	3%	2%	4%	8%
ALASKA	0.6%	2.6%	30.2%	0%	1%	-2%	-1%
ALBUQUERQUE	0.5%	2.2%	38.4%	-1%	0%	0%	-2%
BEMIDJI	0.9%	2.6%	39.1%	5%	1%	1%	6%
BILLINGS	0.7%	2.5%	47.0%	2%	1%	2%	4%
CALIFORNIA	0.4%	2.2%	21.8%	-3%	0%	-4%	-8%
NASHVILLE	0.6%	2.1%	26.9%	0%	-1%	-2%	-4%
NAVAJO	0.5%	2.2%	52.8%	-1%	0%	4%	2%
OKLAHOMA	0.6%	2.1%	28.7%	0%	-1%	-2%	-3%
PHOENIX	0.6%	2.5%	40.3%	0%	0%	1%	1%
PORTLAND	0.5%	2.4%	29.5%	-1%	0%	-2%	-3%
TUCSON	0.7%	2.1%	52.5%	2%	-1%	4%	5%

Caveats and Suggested Improvements. The LNF Workgroup judged the health status index data to be partially usable, and decided to weight the estimated area factor at 50 percent in the final LNF calculation. In general, the Workgroup agreed with the principle that higher rates of births, poverty, and deaths should be associated with high health care need per person. The overall ranking of areas based on these measures also appeared reasonable. The LNF Workgroup identified three different types of caveats to this analysis.

[7] Poverty data were adjusted to account for higher cost of living in Alaska, increasing Alaska poverty rates above those reported in 1990 Census data.

First and most obviously, this is an indirect proxy for health status, and a more direct measurement of health status would be better. For the future, the Workgroup suggested finding better sources of information for health status data. One approach would be to repeat the SAIAN analysis, interviewing enough persons in each of the 12 regions to allow health status to be estimated separate for each IHS Area. A second approach would be to look in greater detail at IHS encounter data, trying to identify incidence of disease in each Area.

Second, this very general health status index does not show the Tribes or the Congress what the underlying health care problems are, or how monies should be allocated to solve those particular problems. Because it is just a broad-brush measure of overall health without linkage to specific heath care problems, it should not be presented as a dollar-for-dollar estimate of need for health care funding.

Finally, there was a general consideration that Areas should not be penalized dollar-for-dollar for good health status, when in part that good health may be the result of success at implementing preventive care and solving behavioral and other health care problems. Even though the Workgroup believed that IHS and Tribes would never stint on such care, they did not want to send a message that Areas and Tribes would be penalized dollar for dollar for any health status improvements that they make.

§3.2 Index of Health Care Prices

As with most goods and services, health care costs are usually highest in large cities and lower in rural areas, while costs in Alaska are substantially higher than the remainder of the country. This price variation needs to be taken into account when estimating the LNF model so that all IHS Areas are compared on a fair basis. All other things being equal, Areas with higher costs will require higher levels of funding.

Methods. In theory, geographic variation in health care costs could be captured in three different ways. These are:

- Measuring average cost of inputs to health care (for example, nursing wages in each geographic area).
- Measuring prices of the outputs of health care (for example, physicians' fees or hospital per diem rates in each geographic area).
- Measuring total spending per person (for example, health insurance premiums in each geographic area).

The first approach relies solely on the cost of inputs to health care. This method captures the costs of a "market basket" of goods and labor that are used in health care. Factors such as nursing wages, rent and utilities, and the costs of equipment and supplies are weighted in proportion to their average importance in health care delivery. The result is a single number that shows geographic variation in the average cost of these inputs.

The advantage of this approach is that data on input costs are readily available. Medicare sets its physician and hospital payment rates in part to match geographic variation in these costs. On average, the rates of other payers will tend to vary in the same direction as Medicare rates (for example, highest in urban areas). For any individual area, however, the gap between Medicare and typical private rates could vary substantially from the average.

The second approach measures what providers of health care charge (collect) for their services. To some degree, this will vary with providers' costs. But it also reflects the average provider's efficiency, the level of competition providers, and the intensity of competition among insurers. All other things being equal, an area with significant oversupply of physicians and hospital beds and a few large insurers would be expected to have lower physician fees and hospital per-diem rates.

This type of price measure would very directly capture the amounts that IHS and Tribes must pay for contract care. The difficulty is in obtaining data to allow a proper price index to be calculated. For this study, there was not enough time to obtain and process IHS claims and encounter data for this purpose.

Yet a third approach would measure total health care cost per person. This approach would capture not only the variation in prices paid for each service, but also variation in the total amount of health care produced. For example, it would reflect local variations in medical practice. Detailed data on health care premiums were not available in time for this analysis, but such data should be available in the near future.[8]

For this analysis, Medicare data were used to construct the local health care cost index used in this analysis. The Medicare program pays hospital, physician and other fees that reflect the cost of providing services in each geographic area. Medicare publishes a Hospital Wage Index (WI) and a Geographic Practice Cost Index (GPCI) that track hospital wages, office rent, equipment and supplies costs, and other elements that enter into health care delivery.

Medicare's Hospital Wage Index is based on the wages and hours data that hospitals report to Medicare. A separate index value is calculated for each Metropolitan Statistical Area. Within each state, all the rural counties receive the same value for the index, based on the average value of wages in those counties. The structure of the Geographic Practice Cost Index (GPCI) is more complex. Some states have one GPCI value for the entire state. Generally, these are states where representatives of the physician community determined that a single state-level payment rate adequately reflected their costs. Other states are divided into several areas, typically representing major metropolitan areas, smaller cities, and rural areas.

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[8] The National Center for Health Statistics, National Employer Health Insurance Survey will, in theory, provide health care premium data for tens of thousands of establishments nationwide. The survey data are scheduled to be released Fall 1999.

For this analysis, Medicare WI and GPCI data were combined to form a single index for each county. Seventy-five percent of care was assumed to vary with the hospital wage index. The remaining 25 percent of care was assumed to vary with the physician GPCI. (By law, the published GPCI data reflect only one-quarter of the variation in cost of living across areas. Accordingly, the data were adjusted to reflect the full difference in cost of living before being used for the computation.)

Weighting the county-level index by the IHS eligible population in each county provides an index value for each IHS Area. Unsurprisingly, Alaska has the highest value, about 25 percent above the U.S. average. Areas on the West Coast have the next-highest values, indicating costs that are slightly above the U.S. average. Costs appear lowest in the Midwest, with Aberdeen and Oklahoma showing costs that are about 20 percent below the U.S. average.[9]

Caveats and Suggestions for Improvement. The LNF Workgroup judged that the health care price or cost data as presented, were not adequate for use in the Area-level LNF calculation. The data as presented reflect estimated wage rates and cost of living in rural areas, typically using statewide rural data. For several reasons, this was viewed as an inadequate measure of variation in costs across IHS areas.

First, the use of data for all rural areas of a state may miss an important distinction for remote rural areas. While costs and wages may be lower, on average, in rural as opposed to urban areas; costs may actually rise in the more remote rural locations. The existing cost data to not capture that effect.

Second, for direct care, the main determinant of costs is Federal pay scales, which tend to be uniform across the country (except for Alaska). Thus, for a substantial proportion of costs, the estimated local hospital wage rates and physician practice costs are irrelevant to the IHS cost base.

Third, for contract care, the amounts that must be actually paid to purchase needed medical services matter more than local hospital wages or physician costs. A tribe that has only a monopoly hospital in its area and must pay hospital charges may face higher cost per admission than a tribe that can negotiate with several hospitals. Tribes may be able to obtain better rates for specialty care in areas with a surplus of physicians.

In the LNF Workgroup's view, a better starting approach to price adjustment would begin with the proportion of direct and contract care to be provided in each area. Direct care would be adjusted based on IHS wage rate and salary data, reflecting IHS cost to produce the care. Contract care would be adjusted based on actual per-service prices paid for the care.

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[9] An alternative method for setting the price indices would follow Medicare policy exactly and adjust only part of health care spending. Only 71 percent of Medicare hospital payment is adjusted for wage differences. The rest is unadjusted, except for a cost-of-living adjustment for Alaska and Hawaii. Price indices constructed that way show the same pattern of costs, but somewhat less variation across areas. At the extremes, the index for Alaska would not change, but the index for Aberdeen would rise from 0.78 to 0.83.

In the short run, the Workgroup resolved this issue by agreeing to form an *ad hoc* Special Task Group to obtain information from the 12 Areas. Local price and wage rate data, along with the desired proportion of care that would be produced via contract health, would be weighted into the LNF formula. Existing price data would only be used to provide a rough estimate of LNF for the short run, until better data could be obtained from the efforts of the Special Task Group.

In the longer run, the Workgroup suggested obtaining price information from the Fiscal Intermediary (FI) that processes IHS claims. Except for California, the FI should process claims from each of the Areas. Actual payment amounts on those claims (appropriately adjusted for case mix) should provide a better measure of prices paid for contract health care in each of the Areas. These data might be supplemented with other information showing typical health care transactions prices in each Area.

§3.3 System Efficiency Index

Service units with more users and larger facilities should be able to provide care more efficiently than smaller units. Each dollar spent in a larger unit, therefore, should produce more health care. Accounting for these "economies of scale" is needed to compare funding and need in larger and smaller service units.

Background on Economies of Scale. Economists generally agree that health care providers show "economies of scale". Within limits, larger clinics, hospitals, and health care systems can produce care more efficiently than smaller ones.

Economies of scale may arise for a variety of reasons. First, the fixed costs of buildings, ancillary personnel, and equipment are spread over a larger number of patients. For example, the cost of building an examination room is the same whether or not the room is fully used. The greater the number of patients seen in that room, the lower is the capital cost per patient. Second, larger size makes it much easier to keep physicians and hospitals fully occupied. In a small population, the daily demand for physician and hospital care is highly uncertain. Facilities designed to meet the peak demand will have significant unused capacity on the average day. For larger populations, by contrast, daily demand for care is much more predictable and less reserve capacity is needed to meet peak demand. Third, greater size leads to efficiency via specialization and "practice makes perfect" effects. For example, a dedicated X-ray technician can probably produce more images per hour than can general nursing staff whose duties may include taking X-rays when needed. Finally, absent any centralized supply system, larger facilities and systems may command economies in bulk purchasing of drugs and supplies.

Productivity statistics for hospitals provide substantial evidence for economies of scale. Hospital occupancy rates rise steadily with the overall size of the hospital (Table 3-2). On a typical day, less than one-third of staffed beds is occupied in the smallest facilities, while more than two-thirds are occupied in the largest facilities.

Table 3-2: Rural Hospital Occupancy Rates by Bedsize, 1987

Bed Size	Number of Hospitals	Admits Per Hospital	Patient Days	Occupancy Rate
6 to 24	200	418	2,265	31%
25-49.	817	918	5,241	38%
50-99.	893	1,854	13,520	51%
100-199	539	3,842	29,749	59%
200-299.	135	7,325	54,516	64%
Over 300	37	12,603	97,143	70%
Total	2,621	2,295	16,710	48%

Source: OTA 1990

Data on physician group practices also suggest higher productivity for larger organizations. Practices with four to eight physicians produce about 20 percent more visits per physician per week than do solo-physician practices (Table 3-3). Beyond this group size, productivity appears to decline somewhat. This has been attributed to the dilution of economic incentives in very large groups, rather to any technical factors that might interfere with production. Physicians may have less financial incentives for productivity in the largest groups, or more productive physicians may prefer smaller groups where that productivity leads directly to higher income (Gaynor and Pauly, 1990).

Table 3-3: Physician Visits Per Week, 1997

Practice Size	Visits Per Week
1 physician	106
2 physicians	117
3 physicians	127
4 to 8 physicians	128
Over 8 physicians	123

Source: AMA 1998

Health care systems such as health maintenance organizations (HMOs) also exhibit economies of scale. Based on analysis of HMOs that do and do not survive in competitive markets, one study suggested a minimum enrollment of 60,000 is required to exhaust economies of scale (Clement 1995). Others have suggested strong economies of scale for HMOs up to enrollment of 115,000 (Given 1996).

Estimating the exact numerical impact of economies of scale is difficult. Economists use a single number to capture the effect of economies of scale. They attempt to estimate the percent increase in output that occurs for every one percent change in inputs. For example, does a 100 percent increase in the number of physicians or hospital beds result in more or less than a 100 percent increase in visits or discharges? A wide range of factors can affect statistical studies of this issue, including the underlying data, the statistical method used, and the size of the facility used as the basis of comparison.

A comprehensive study of physician practices shows a wide range of estimates, but concludes that there is evidence of economies of scale for physician practices (Pope and Burge, 1992). For small group sizes, the majority of studies suggest modest returns to scale in the range of 5 to 15 percent, meaning that every 100 percent increase in the size of a practice increase in the total number of visits per physician by 105 to 115 percent.

Analysis of hospital economies of scale is more difficult due to variations in case mix from smallest to largest hospitals. The data of Table 3-2 imply average economies of scale between 13 percent (in terms of discharges) and 31 percent (in terms of days), when contrasting the 6 to 24 bed hospitals against the 200 to 299 bed hospitals. On average, a 100 percent increase in hospital size should result in a roughly 113 percent increase in discharges and 131 percent increase in days of care produced by that hospital.

Methods. IHS staff currently use a formula when comparing costs and funding across individual service units. The IHS approach is based on the total population in the service unit, rather than the size of the individual facilities within the service unit. The IHS formula compares service units in terms of the mathematical log of the number of individuals served in the unit.[10]

The formula currently used by IHS staff is similar in concept and size to the economies of scale estimates cited above. The IHS estimate is actually framed in terms of an estimate of inefficiency for small units, but that results in an estimate of greater (relative) efficiency for larger units, or economies of scale. Overall, the IHS formula implies that each doubling of the size of a service unit should result in a roughly 10 percent increase in productivity within the unit. This factor declines somewhat by size, with the strongest increases in efficiency shown for increases in the smallest service unit sizes (Table 3-4). This 10 percent factor is in the middle of estimated scale economies for physician offices, and is at the low end of estimated scale economies for hospitals. Thus, the IHS provides an economies of scale adjustment that is consistent with (but somewhat more conservative than) those shown in the literature.

[10] The functional form is: $-0.56095 + 0.058*\ln(\text{Users})$.

Table 3-4: IHS Efficiency Factor by Size of Service Unit

Number Of Users In Service Unit	IHS Efficency Factor (From Formula)	Implied Factor for Economies of Scale
125	72%	
250	76%	11.2%
500	80%	10.6%
1000	84%	10.1%
2000	88%	9.6%
4000	92%	9.1%
8000	96%	8.7%
16000	100%	8.4%
32000	104%	8.0%
64000	108%	7.7%

IHS staff calculated efficiency factors for each service unit, and then averaged by Area. The resulting table shows modest variation in efficiency factors across areas. California and Nashville, with very small service units, suffer the largest efficiency penalties. In any subsequent calculations, actual IHS spending in those areas would be reduced by these percentages to account for the inefficiently small size of the service units. (All other things equal, these areas would appear relatively less well funded due to this adjustment). Navaho and Oklahoma, by contrast, have very large service units and accordingly have a positive efficiency adjustment. In subsequent calculations, each dollar of IHS spending will be inflated by these factors to account for the greater efficiency of operation in larger service units.

Table 3-5: IHS Efficiency Factor by Area

IHS Area	Users, 1999 (estimated)	IHS Efficiency Factor
ABERDEEN	104,695	-3.50%
ALASKA	109,658	-0.10%
ALBUQUERQUE	83,266	-0.60%
BEMIDJI	82,889	-3.80%
BILLINGS	66,307	-3.60%
CALIFORNIA	65,529	-8.90%
NASHVILLE	39,998	-8.70%
NAVAJO	204,641	4.00%
OKLAHOMA	290,946	4.80%
PHOENIX	125,291	0.60%
PORTLAND	85,952	-5.50%
TUCSON	21,699	-1.20%

Caveats and Suggestions for Refinement. Despite some misgivings, the LNF Workgroup agreed that the IHS system efficiency adjustment should be included as an adjustment. In the final LNF calculation, this adjustment is to be calculated at the service unit level, and is to be weighted 100 percent in the LNF calculation.

The LNF Workgroup's main hesitation in using the system efficiency adjustment is that it is based on population, rather than more directly on facility size. Alaska, in particular, has many small village facilities within a single large service unit. Thus, for Alaska, there may be a substantial difference between efficiency factor calculated from population in a service unit and efficiency factor calculated based on the individual small facilities in a service unit.

In the short run, the LNF Workgroup agreed to use the existing adjustment, with the modifications suggested above. In the longer run, the LNF Workgroup would like to see this adjustment based more closely on facility sizes, not population in each service unit. In addition, the impact of medical centers should be studied separately, because these centers may help economize significantly on contract health services spending.

§3.4 Other Insurance Coverage

The most controversial portion of this report is the estimate of payments by other insurers. The estimates shown here are higher than those in the prior LNF report, and higher than those in a recent report on this topic by the Barents Group (Barents Group 1999).

Third-party insurers' spending on behalf of the IHS User population cannot be measured directly from currently available data. IHS users are not separately identified in insurers' data. Instead, spending must be approximated from a variety of sources, and the methods used will depend on the data available for each insurer. In this section, methods for estimating payments for each payer are presented, and then significant caveats and suggestions for better approaches are offered.

Although the ultimate target population for this analysis is the IHS User population, all estimates have to be calculated first for the IHS eligible population. A subsequent step will convert the per-capita estimates into spending totals based on counts of User population. This approach is necessary because most of the information available (from federal programs, from the Census) is based on self-reported race. The race-based definition matches the IHS eligible population, that is, individuals of self-reported AI/AN race living within the boundaries of IHS service units.

Methods: Medicaid. Medicaid programs report the number of eligible individuals and annual expenditures by race. These reports are known as HCFA 2082 and HCFA 64 reports. HCFA 2082 data show individuals and payments by race, eligibility, age, and other factors. The 2082 data do not capture all spending, however, particularly for those states with significant Medicaid managed-care enrollment. They must be combined with the HCFA 64 reports (financial accounting data) to provide a complete picture of Medicaid funding in each state.

These reports provide an estimate of 1997 state-level Medicaid spending for a population with self-reported AIAN race. Because these data reflect actual spending in the Medicaid programs, they seemed the best source for estimating Medicaid payments on behalf of the IHS user population. The following steps were required to move from the FY 1997 HCFA 2082 and HCFA 64 reports to estimate Medicaid spending for the IHS eligible population in each state.

1) Fix obvious problems with HCFA 2082 data, impute data where missing. The most important problem with FY 1997 Medicaid 2082 spending data is that Arizona did not report spending by race. This is a serious omission, because Arizona reports more than 90,000 Medicaid enrollees of AI/AN descent, or nearly 18 percent of the U.S. total. The raw total spending reported on the FY 1997 HCFA 2082 for AIAN population is therefore a significant understatement of actual spending for that population. (The next largest AI/AN Medicare enrollments are for Oklahoma and New Mexico, each reporting about 47,000 AI/AN Medicaid eligibles.)

For all states reporting complete data, the ratio of Medicaid spending per AI/AN individual to Medicaid spending per person overall averaged 0.70. For Arizona, therefore, AIAN spending per capita was assumed to be 70 percent of average Medicaid spending per eligible in the state. This resulted in a substantial upward adjustment in estimated Medicaid spending for all AIAN, relative to the raw data on the raw HCFA 2082 form. Similar gap-filling approaches were taken for a few other states with missing data, but none of these states had significant AI/AN enrollment.

2) Inflate to match control totals on HCFA 64 data. HCFA 2082 data show spending and eligibility by race but do not capture all Medicaid payments. In particular, premium payments to HMOs are not reported on the 2082 data. For states with large Medicaid managed-care populations, the 2082 data understate total spending. This is a significant omission for several states with large AIAN populations, including Arizona and California. HCFA 2082 data were inflated to match HCFA 64 total spending after payments to disproportionate share hospitals were removed from the HCFA 64 totals.[11]

3) Adjust for nursing home services included in AIAN spending. Long-term care services are not covered as part of the benefit package being modeled in the LNF work. These costs must be removed from the Medicaid AI/AN totals. Unfortunately, the Medicaid 2082 data do not separately break out long-term care costs for AIAN enrollees, so any adjustment for these costs must be an approximation.

Evidence on the use of nursing home services by the AIAN population is scarce. Survey data typically do not have enough AIAN individuals sampled to provide a reliable estimate for AI/AN individuals even at the national level. Analysis of the 1995 National Nursing Home Survey shows just 38 AI/AN individuals out of a sample of more than 8,000 individuals. None of the standard files from the 1990 Census (neither the summary tabulations nor the public use micro data files) provide any opportunity to count AIAN individuals in nursing homes.

Anecdotes suggest very little nursing home use by this population, but Medicaid programs provide little hard evidence. Accordingly, the estimates were run two ways. First, using the totals as reported on the 2082 forms, and second, reducing the totals in proportion to the fraction of all spending going to nursing home and related long-term care services.

4) Inflate 1997 spending by 12 percent to match 1999 data. Congressional Budget Office (CBO) budget projections show Federal Medicaid spending rising more than 12 percent between 1997 and 1999. (Estimated total spending (Federal and State) was projected to rise somewhat faster.) These numbers agree well with projections from the Executive Office of Management and the Budget (OMB). The data presented here assume a uniform 12 percent increase in AI/AN Medicaid costs between 1997 and 1999. This is just slightly lower than CBO and OMB projections for Medicaid growth over this period.

5) Allocate state AIAN enrollment to counties using Census data on AIAN population in poverty in each county. The first four steps provided a state-level estimate of Medicaid coverage and spending for AI/AN individuals. These state-level

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[11] Disproportionate share payments are subsidies to hospitals treating a "disproportionate share" of poor and charity-care patients. Nationally, almost one-third of Medicaid hospital payments consist of such subsidies to disproportionate share hospitals. These payments are explicit subsidies for charity care, do not reflect the value of care delivered to Medicaid enrollees and so should not be considered when totaling Medicaid spending for the LNF calculation.

estimates must now be allocated to the individual counties within the state, for match against the county-based definitions of IHS service areas.

There is no national file of Medicaid AI/AN enrollment by county, or even Medicaid total enrollment by county. The distribution of Medicaid enrollment across a state must therefore be imputed from other sources. For this analysis, 1990 Census data on poverty by race by county were used to allocate total AI/AN Medicaid enrollment to the individual counties. State Medicaid AI/AN enrollment was allocated to each county based on the fraction of the state's AI/AN poverty population in that county. Counties with large AI/AN poverty population were assumed to have large AI/AN Medicaid enrollment, and similarly those with few AI/AN individuals in poverty were assumed to have few AI/AN Medicaid enrollees.

California publishes AI/AN Medicaid enrollment by county. This gives one check on the reasonableness of the allocation method. For California, projected and actual AI/AN Medicaid enrollment was quite close except for Los Angeles, where actual Medicaid enrollment was lower than predicted based on poverty rates. For this one state, the method of allocating AI/AN Medicaid eligibles based on county poverty rates gives a reasonable estimate of the actual distribution of enrollment.

5) Allocate counties to IHS service units. The IHS has provided files linking counties to IHS service units. In some instances counties are split among several units, or only partially in the service area. In these cases, Medicaid enrollment and spending were split according to the IHS-supplied data on proportion of county AI/AN population in each service unit. Throughout this analysis, 1997 service unit definitions were used, because the data will eventually be linked to 1997 counts of user population.

6) Summarize dollars and individuals by IHS Area and State. Only those individuals within the IHS service area are counted for this analysis. Counties outside IHS services areas were excluded. Persons and dollars in the IHS counties were summarized by IHS service area and state. For the IHS eligible population, this approach gives total estimated Medicaid spending for IHS eligibles of $920M. That total will fall somewhat when these per capita estimates are applied to the (smaller) IHS User population.

7) Model Medicaid AI/AN enrollment in proportion to AI/AN poverty. Analysis of the initial sets of numbers showed very wide variation in the percent of the AI/AN population reported enrolled in Medicaid. In general, states with higher AI/AN poverty rates has higher Medicaid enrollment, but this was far from uniform. An alternative modeling method was to assume that AI/AN were enrolled in Medicaid in proportion to AI/AN as a fraction of the poverty population in each state. (That is, if AI/AN were ten percent of the poverty population in a state, they were assumed to be 10 percent of the Medicaid population in the state.) This gave substantially higher estimated Medicaid enrollment in California, and lower Medicaid enrollment in the upper Plains states.

8) Assess results and contrast to Barents Group report. Table 3-6 gives the results for the 12 IHS areas, with payments modeled two ways. The first approach takes the data (with corrections) straight from the 2082 reports, with modifications noted above. The second removes estimated payments for long-term care and similar services, and assumes that AI/AN Medicaid enrollment is proportional to AI/AN poverty population in each state.

Based on the method used, Medicaid programs are estimated to have paid between $452 and $642 per IHS user, on average. The $643 figure can be viewed as saying that Medicaid spending per Medicaid-covered AI/AN individual is about $2500 per year, and that Medicaid covers about one-quarter of the IHS eligible population.

Table 3-6: Two Estimates of Medicaid Spending per IHS Eligible

IHS Area	MEMO: Unempl. Rate, BLS Def'n.	MEMO: Percent of Pop. in Poverty	Pct of Pop with Medicaid No Adj.	Pct of Pop with Medicaid Two Adj.	Medicaid $ per IHS Eligible No Adj.	Medicaid $ per IHS Eligible, Two Adj.	Split the Differ-ence
ABERDEEN	25%	55%	49%	35%	$1,275	$388	$831
ALASKA	22%	23%	31%	32%	$1,119	$779	$949
ALBUQUERQUE	16%	38%	22%	33%	$502	$452	$477
BEMIDJI	20%	39%	26%	39%	$739	$395	$567
BILLINGS	28%	47%	37%	30%	$969	$383	$676
CALIFORNIA	14%	22%	14%	28%	$188	$213	$200
NASHVILLE	13%	27%	13%	29%	$388	$388	$388
NAVAJO	25%	53%	38%	50%	$766	$678	$722
OKLAHOMA	12%	29%	15%	20%	$338	$180	$259
PHOENIX	18%	40%	27%	36%	$554	$512	$533
PORTLAND	15%	29%	23%	38%	$827	$692	$760
TUCSON	18%	53%	36%	45%	$665	$613	$639
Average					$642	$452	$547

Note: See text for description of two adjustments

Either of these approaches gives estimated Medicaid spending substantially higher than the amount estimated in a recent report from the Barents Group (Barents Group 1999). The recent Barents Group report estimated Medicaid spending at $318 per person for this population. One important difference is that the Barents Group estimate is for the U.S. AI/AN population, while the estimate here is for the IHS service area population. AI/AN individuals in these areas have somewhat higher poverty rates (and higher rates of Medicaid coverage) than the U.S. population as a whole. A second reason for the difference relates to the treatment of reported HCFA 2082 data. While this analysis made numerous adjustments, the Barents Group number appears to be benchmarked to the totals as reported on the 2082 data.

While the national average data appear potentially plausible, data for individual IHS Areas shows very high variation. Based on data as reported on the 2082 (with adjustments), there is nearly a seven-to-one variation in Medicaid dollars per capita. Much of that variation comes from the fraction of the population estimated to be covered by Medicaid, ranging from a low of 14 percent in California to nearly half the population in Aberdeen.

One explanation is that these data actually reflect the underlying variation in the state Medicaid programs. Criteria for coverage, rules for enrollment, generosity of benefits, and provider payment rates all vary substantially across states. Alternatively, Medicaid program counts of AI/AN individuals may sometimes be significantly in error.

Hispanic origin was considered as one potential explanation of low AI/AN Medicaid counts in some states, but was rejected. Medicaid data require individuals to report themselves either as AI/AN or Hispanic, not both. Data from 1990 Census, however, show that at most 21 percent of the AI/AN population in any of the reservation states reported themselves as being of Hispanic origin. Thus, systematic underreporting of AI/AN based on recording of Native Americans of Hispanic origin would not account for the very low reported Medicaid enrollment in California.[12]

Qualitatively, the results from the Medicaid administrative data appear to track other indicators based on Census data. The three areas with the lowest participation in Medicaid also have the lowest unemployment rates (using the Bureau of Labor Statistics definition), the highest median income relative to the local White population, and the lowest poverty rate (data not shown). At the other end of the spectrum, the reverse is true. The areas with the highest Medicaid participation have the lowest incomes relative to the White population, and the highest unemployment and poverty rates.

Either of these approaches suggests that about half the volume of Medicaid-funded care that does not pass through IHS facilities. Estimated total Medicaid spending for AI/AN is about twice estimated IHS Medicaid collections, even after adjusting for the lack of collections data for the 38 percent of IHS budget that passed through Tribal systems (with no collections data reported). This assertion of significant Medicaid cost avoidance is bolstered by analysis of information on AI/AN births. Based on a birth rate of 26 per 1000, there should have been about 38,000 births in the IHS eligible population in 1995. Yet, there were only 14,000 total discharges for deliveries in IHS facilities in 1995, based on IHS patient care statistics.[13] Although the IHS patient care data are incomplete, and although deliveries occur outside the hospital inpatient setting, this statistic suggests that a substantial portion of care is provided and funded outside IHS facilities.

State Medicaid program data occasionally provide an additional check on the fraction of care provided outside IHS facilities. Alaska's annual Medicaid report shows total payments to IHS and Tribal facilities (State of Alaska 1998). In fiscal year 1997, Alaska spent roughly $40M in IHS facilities (Alaska Medicaid FY 97 report). But, Alaska Medicaid spent about $100M on the AI/AN population in total. Thus, in Alaska, about half the care for the AI/AN Medicaid population was delivered outside IHS facilities.

Methods: Medicare. Estimating Medicare spending presents a different set of challenges. Unlike Medicaid, Medicare has no usable data on eligibles and spending for AI/AN race. Instead, estimates for Medicare must be built up from three independent

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[12] The Current Population Survey was considered but rejected as an alternative source of information on Medicaid coverage of AI/AN individuals. Estimates from that survey were highly unstable from year to year. The 1995, 1997, and 1998 March Supplements to the CPS gave estimated Medicaid enrollment of 31, 42, and 21 percent of the AI/AN population, respectively.

[13] Trends in Indian Health, U.S. Indian Health Service, Rockville, MD, 1997.

pieces of information. First, Census data (as updated by IHS staff) provide counts of the elderly and non-elderly IHS eligible population. Second, two sources of survey data (SAIAN and the Current Population Survey) give estimates of the fraction of the AI/AN population enrolled in Medicare. Finally, Medicare administrative data provide county-level data on cost per person for all races, and the AI/AN population is assumed to have costs identical to the remainder of the Medicare population.

For these estimates, therefore, variation across IHS areas will be due to just two factors. There is slight variation in the age structure of the population across areas, and there is modest variation in Medicare payment per capita. The analysis assumes that a uniform proportion of the elderly and non-elderly AI/AN population is enrolled in Medicare.

1) Count of elderly and non-elderly AI/AN population. Census data as updated by IHS staff provide counts of the elderly and non-elderly IHS eligible population. These Census-based population data are used throughout the remainder of the calculation.

2) Proportion of the elderly and non-elderly AI/AN population with Medicare coverage. Individuals may qualify for Medicare either by age or through disability. A large portion of the population over age 65 qualifies for Medicare, while a small fraction of the under-65 population qualifies.

Two surveys provide estimates of the proportion of the AI/AN population with Medicare coverage. The Survey of American Indians and Alaska Natives (SAIAN) provides an estimate for the IHS eligible population for 1987. The Current Population Survey provides an estimate for individuals of self-reported race AI/AN for 1998.

The CPS reports a higher fraction of the population covered by Medicare than SAIAN does. This may reflect any number of things, including true changes over time, a difference in population definition, or the sampling error of the CPS when used to make inferences about the AI/AN population. Given that SAIAN was specifically targeted to the IHS eligible population, the coverage estimates from SAIAN are used throughout the remainder of the analysis.

Table 3-7: Percent of AI/AN Population with Medicare Coverage

Survey	Over age 65	Under age 65
SAIAN 1987	84%	1.1%
CPS March 1998	93%	2.4%

3) Medicare payment per AI/AN person. There appears to be no reliable direct estimate of Medicare spending per person for the AI/AN population. After reviewing the evidence, this analysis assumes that Medicare spending per AI/AN individual in any area is identical to Medicare spending for the entire population in that area.

The Barents' Group analysis shows an extremely low figure for Medicare spending per AI/AN individual. That report shows just $67 per AI/AN person, with 8.7 percent of the

AI/AN population enrolled in Medicare (Barents Group 1999). That suggests average Medicare spending per AI/AN enrolled of just $750 per person, a fraction of the U.S. average of about $5500 per person in 1997.

Medicare county-level spending data provide no evidence for such a low spending estimate. Census data were used to identify the 30 counties where AI/AN individuals make up the highest proportion of the elderly. Estimated Medicare payment per person in these counties appears no different from the rest of the country, and does not approach the low level that is implied by the Barents analysis (Table 3-8).

Table 3-8: Counties with Highest Proportion of AIAN Elderly

State	County	IHS Serves Cnty?	90 Census Elderly	AIAN % Of elderly	Actual Medicare 1997 Cost	Mcr Cost Using Barents Estimate
AK	Wade Hampton Cens	Y	258	100%	$3,465	$750
AK	North Slope Borou	Y	191	95%	$7,315	$974
AK	Northwest Arctic	Y	253	94%	N/A	$1,013
AK	Bethel Census Are	Y	663	94%	$3,413	$1,015
AK	Aleutians West Ce	Y	71	89%	$5,248	$1,285
AK	Aleutians East Bo	Y	48	88%	$5,248	$1,344
AK	Nome Census Area	Y	388	84%	$3,868	$1,509
AK	Lake and Peninsul	Y	91	84%	N/A	$1,533
SD	Shannon County	Y	536	83%	$3,989	$1,548
AK	Dillingham Census	Y	205	82%	N/A	$1,607
AK	Yukon-Koyukuk Cen	Y	365	79%	$5,295	$1,752
AK	Bristol Bay Borou	Y	35	77%	$4,892	$1,836
AZ	Apache County	Y	3863	75%	$3,900	$1,961
SD	Todd County	Y	553	70%	$5,327	$2,193
AK	Prince of Wales-O	Y	208	62%	$5,409	$2,554
WI	Menominee County	Y	328	61%	$4,323	$2,618
NM	McKinley County	Y	3668	57%	$3,949	$2,787
SD	Buffalo County	Y	132	55%	$4,591	$2,873
AK	Skagway-Yakutat-A	Y	235	43%	$4,636	$3,479
ND	Sioux County	Y	235	41%	$5,000	$3,539
SD	Dewey County	Y	459	38%	$4,087	$3,699
UT	San Juan County	Y	787	37%	$3,809	$3,726
AZ	Navajo County	Y	6264	35%	$4,634	$3,814
ND	Rolette County	Y	1238	35%	$4,996	$3,816
NM	Cibola County	Y	1931	35%	$4,172	$3,845
MT	Glacier County	Y	1104	33%	$4,794	$3,942
SD	Ziebach County	Y	173	29%	$4,329	$4,100
OK	Adair County	Y	2355	28%	$5,246	$4,155
AK	Kodiak Island Bor	Y	423	26%	$6,313	$4,287
NC	Robeson County	N	10658	25%	$5,109	$4,290

Unfortunately, Medicare administrative data do not allow a direct check on spending for AI/AN beneficiaries. Race AI/AN on Medicare administrative files is based on Social Security data. Only those individuals receiving Social Security Numbers (SSNs) after 1981 routinely had the option to code AI/AN race. Thus, the population identified as AI/AN on Medicare administrative data largely reflects individuals who qualified for Medicare while still quite young, that is, the disabled and the ESRD population.

Barring better information, the county-level analysis suggests that total Medicare spending for the AI/AN population does not differ markedly from that of the rest of the population. Thus, Medicare average costs in each county (for the entire population) times the estimated number of Medicare-eligible AIAN is used to calculate total Medicare spending on behalf of the AI/AN population. Based on recent Medicare program data, no net cost inflation is assumed between 1997 and 1999.

4) Summarize dollars by Area and State. Table 3-9 shows Medicare spending per IHS eligible. In aggregate, the data imply that average Medicare spending per Medicare-covered AI/AN is about $4,700 (somewhat below the U.S. average due to the rural location of this population), and that less than 6 percent of the AI/AN population is enrolled in Medicare. Regional variation is small, mostly because there is only modest variation in elderly as a proportion of the population.

Table 3-9: Estimated Medicare Spending Per IHS Eligible, 1999

IHS Area	IHS Eligible Population	Medicare $ per IHS Eligible	Pct of IHS Eligible in Medicare
ABERDEEN	98493	$213	5.1%
ALASKA	105644	$231	5.0%
ALBUQUERQUE	80175	$235	5.5%
BEMIDJI	81974	$235	5.7%
BILLINGS	56609	$217	4.8%
CALIFORNIA	128548	$334	5.9%
NASHVILLE	75289	$314	6.0%
NAVAJO	216597	$220	5.4%
OKLAHOMA	307745	$380	7.8%
PHOENIX	144255	$251	4.7%
PORTLAND	152950	$226	5.0%
TUCSON	28202	$317	5.6%
Total	1476481	$275	5.8%

5) Contrast to Barents Group estimate of spending. Average Medicare spending per AI/AN estimated here is roughly five times higher than that estimated by the Barents Group. This is due entirely to Barents estimate of spending per Medicare-covered person. Barents actually estimates a higher percentage of the AI/AN population is covered by Medicare, based on responses to the March 1998 CPS.

The underlying spending for the Barents Group analysis comes from analysis of the claims data in SAIAN. Replicating that Barents Group analysis identifies the source of the problem, and points to some potential for other SAIAN-based analysis of costs to provide a potentially misleading picture of the share of spending by payer.

To replicate the Barents Group methods, costs from the SAIAN claims data were summarized for each person. Costs for IHS direct care were imputed based on average costs incurred for similar services provided outside IHS facilities. No payer data are given in SAIAN for services reported provided at IHS facilities. Barents Group assigned all costs on such claims to IHS direct care. (This method follows the approach taken in earlier analyses of these data.)   Using this method, estimate IHS spending far exceeds actual 1987 IHS spending and must be substantially deflated to match actual 1987 totals.

Using this methodology, Medicare spending appears quite low. A detailed look at these data, however, reveals implausible spending patterns for the elderly. Categorizing the elderly in terms of their insurance coverage, and categorizing the claims data in terms of imputed source of payment results in Table 3-10. Estimated Medicare spending is trivial except for those who have both Medicare and private coverage. Under current payment rules, nearly all of the costs of individuals with any Medicare coverage would be paid by Medicare, not as this methodology implies, by the IHS.   This analysis strongly suggests that the methods used to impute payment source from the SAIAN claims data have created an artificially low estimate of Medicare spending per person.

Table 3-10: SAIAN 1987 Estimated Payments by Insurer, for Elderly AI/AN Individuals with Various Combinations of Insurance Coverage

Individual's Insurance Coverage	Estimated Payments Made by Each Insurer: IHS	M'CARE	M'CAID	PRIVATE	OTHER	No. of Individuals In Sample
MCR+MCD+PRI	$3,266	$153	$201	$114	$472	9
MEDICAID ONLY	$2,586	$0	$3	$0	$70	28
MEDICARE ONLY	$2,344	$243	$13	$0	$454	125
MEDICARE+MEDICAID	$1,401	$146	$1,462	$0	$770	129
MEDICARE+PRIVATE	$871	$2,236	$0	$2,525	$476	63
NONE	$1,661	$0	$0	$0	$82	41
PRIVATE ONLY	$201	$0	$1	$57	$95	13

Methods: Private Insurance. No data are available on the level of private insurance spending on behalf of the AI/AN population in each IHS Area. Indeed, other than for SAIAN, there is no information at all on private insurance spending for this population. More recent national surveys of health care spending include far too few AI/AN individuals to allow estimates to be calculated. (Depending on the year of data, for example, the Medical Panel Expenditures Survey (MEPS) has about 25 AI/AN individuals, and the Medicare Current Beneficiary Survey has about 10 AI/AN individuals.)

For private spending, the estimate must be extrapolated from SAIAN data using a regression methodology. This approach has three parts.

1) Predict likelihood of private insurance coverage. SAIAN was used to predict the likelihood that an individual had private insurance, based on income, employment status, poverty status, and Medicaid coverage. The results of this regression give the average likelihood that a person has private insurance coverage. (Because so many children are covered by parents' coverage, this regression was actually run for families in SAIAN, not individuals.) Results were plausible: employment and income increased the likelihood of coverage, while poverty and Medicaid coverage decreased it.

2) Use Census data to show poverty, employment, and income for AI/AN population in each area. Second, Census and other data from each county supply information on employment, poverty, and income for the AI/AN population in each county, for 1990. Medicaid coverage data are also included. When combined, these yield a predicted level of insurance coverage for the AI/AN population in each county. In aggregate, about 26 percent of individuals in SAIAN report some form of private insurance coverage during the year. The 1999 IHS population results, using Census data, were adjusted to match the SAIAN average of 26 percent.

3) Calculate spending per insured from SAIAN, inflate to 1999. Finally, spending per person is needed to complete the estimate. In principle, a regression-based approach could have been used to estimate private health insurance spending. In practice, regression estimates of spending from the SAIAN gave implausible results. Accordingly, SAIAN data are used to provide just one number -- average private spending per privately insured person. This number was inflated by 2.25, based on the growth of private health insurance spending per person between 1987 and 1999. The resulting estimate of roughly $925 per insured person forms the basis of the private spending estimate. This figure is adjusted for local health care prices in each area as part of the overall calculation.

This figure of $925 per insured person appears substantially lower than the U.S. average per person cost for the privately insured. This may reflect the nature of insurance coverage for this population (lower coverage, few months of the year covered). Alternatively, it may reflect Tribal-supplied private insurance for which IHS cannot make collections. Finally, it may reflect the same types of problems with the SAIAN claims data as were encountered in the Medicare analysis above. This is the only portion of the calculation that relies on estimated costs from the SAIAN file.

4) Summarize by Area and State. Table 3-11 shows the results of the calculation. Variation in per-capita private spending in these estimates comes from two sources.

First, the cost per insured person varies slightly, as the national figure was multiplied by local factors for the cost of health care. More importantly, the predicted percent of the population with private health insurance varies widely across areas. For example, Aberdeen has high poverty and high Medicaid enrollment. As a consequence, predicted private insurance coverage is low. Thus, to some degree, these data partially offset the wide variation in estimated Medicaid spending calculated earlier. Higher Medicaid coverage means lower estimated private insurance coverage, and because Medicaid coverage was estimated two ways, private coverage must also be estimated two ways.

Table 3-11: Estimated Private Insurance Payments per IHS User

IHS Area	Estimated Private Pmts (Medicaid w/ No Adjustments)	Estimated Private Pmts (Medicaid w/ two adjustments)	Split The Difference
ABERDEEN	$117	$142	$129
ALASKA	$404	$402	$403
ALBUQUERQUE	$230	$208	$219
BEMIDJI	$247	$219	$233
BILLINGS	$173	$187	$180
CALIFORNIA	$399	$362	$381
NASHVILLE	$349	$315	$332
NAVAJO	$116	$91	$103
OKLAHOMA	$278	$269	$273
PHOENIX	$246	$226	$236
PORTLAND	$360	$325	$343
TUCSON	$160	$139	$150
Average	$261	$244	$253

This estimate is about half the level of the private health insurance spending estimate in the recent Barents Group report. The difference is due almost entirely to the estimated proportion of the population covered by private insurance. This analysis assumes 27 percent of the population is covered (based on SAIAN), while Barents assumes that over 50 percent of the population has private insurance, based on March 1998 CPS.

Caveats and Suggestions for Better Methods. The LNF Workgroup believed that the non-IHS insurance coverage estimate was substantially in excess of the actual level of insurance coverage for the IHS User population. The LNF Workgroup pointed out that a significant assumption underlying the work was demonstrably incorrect for certain Medicaid programs. The analysis assumes that Medicaid spending per IHS *eligible* is identical to Medicaid spending per IHS *user*. This is a significant assumption; and, for States with large Medicaid managed-care enrollment, it is known to be incorrect.

Arizona Medicaid illustrates the issue. A substantial number of Medicaid-enrolled AI/AN individuals in Arizona are unable to use IHS facilities. They are enrolled in plans other than Tribal-run plans and cannot routinely access Tribal or IHS facilities. This means that Medicaid spending is not spread uniformly across the eligible population, but is instead concentrated on the non-IHS-user portion of the population.

Data from the Arizona Medicaid program's 1997 annual report show that this may have a substantial effect on the calculation (State of Arizona 1998). IHS users are roughly 80 percent of IHS eligible population in Arizona. Accordingly, the calculation above assumes that 80 percent of the AI/AN Medicaid population is made up of IHS users. Arizona Medicaid data show, to the contrary, that only 50 percent of the AI/AN Medicaid population had any IHS use (any Medicaid payment to IHS or Tribal facilities or systems). Thus, the current calculation substantially overstates Medicaid support for the IHS user population in Arizona.

For both Medicaid and Medicare, the Workgroup agreed that the most accurate solution would be to match IHS User rolls against Medicare and Medicaid data. Because the majority of IHS Users have Social Security Numbers (SSNs), the Health Care Financing Administration could do a match with some accuracy. Person-level matching, followed by analysis of Medicare and Medicaid claims to calculate total payments, would make the methods used by the current analysis completely obsolete.

Payments by private insurers pose additional problems. The LNF Workgroup was not convinced that payments accurately reflected the decline in private insurance coverage in recent years. In addition, the Workgroup was not convinced that payments from Tribal-purchased private insurance were excluded. In the Hopi nation, for example, about 30 percent of all private insurance coverage is Tribal-supplied coverage for employees. Because IHS cannot collect from this Tribal-supplied private insurance, these payments must be excluded from the calculation.

§3.5 IHS Budget and Overlap with Benefits Package

The method used to apportion IHS spending between personal health care services and other spending was described in full in the first LNF report (I&M.CHPS 1999). IHS staff examined each line item in the budget and determined percent overlap with the mainstream health benefits package being modeled. These percentages were applied to the IHS Area-level budget data for this analysis.

Caveats and suggestions for improvement. The LNF Workgroup considered some specific additional budget adjustments for Alaska and other areas. Patient transportation costs are 12 percent of the Alaska area budget, and should probably be identified and treated separately in the calculation. (By comparison, patient transportation costs for California Medicaid are less than 1 percent of spending.) In addition, Alaska has nurses' aide training costs that should probably be removed from the budget, as all other health personnel training costs have also been removed.

More significant issues arise if LNF is to be calculated for individual service units. The presence of tertiary care and referral facilities means that the some service units will show very high costs, having provided treatment to a far larger population that just the residents of that service unit. The LNF Workgroup noted that the impact of individuals crossing service unit boundaries should be considered when calculating LNF, and that this will require detailed analysis of IHS user count and encounter data.

Finally, if LNF is calculated for individual service units, some aspects of the calculation will remain Area-wide estimates. Health status data, in particular, are apt to be subject to substantial random variation if calculated for small service units. Other data elements, such as budget numbers, can be successfully calculated for small service units.

§3.6 User versus Eligible Population Counts

A final issue with substantial impact on the LNF estimate is the choice of base population for the analysis, and the quality and content of the underlying population count data. The actuarial approach to LNF establishes a per capita spending benchmark for each Area. This substantially increases the importance of the population count data in establishing the funding allocation, and may suggest that further work be targeted toward examining the basic population counts.

Two basic sets of population counts exist. The count of IHS users consists of all individuals who have had some contact with IHS-sponsored health care during the last three years, and are captured by the IHS patient registry system. The count of IHS eligibles, by contrast, consists of all AI/AN individuals residing within IHS service areas, as reported in the 1990 Census and updated annually for population growth.

In aggregate, there are roughly 1.3M users and 1.5M eligibles. For individual service units and areas, however, these two counts often disagree substantially. For example, the count of users exceeds the count of eligibles in five of the 12 IHS Areas, and, within Areas, for about 40 percent of the IHS service units. Conversely, in two areas the count of eligibles is roughly twice the count of users. Clearly, the choice of baseline population will make a substantial difference in estimated LNF, as total IHS spending is divided by the population count.

These two counts of population need not agree. Eligibility to use IHS facilities is based on tribal membership, not race. Tribes determine differing degrees of Native American ancestry required for Tribal membership. Census data, by contrast, are based entirely on race. While the expectation is that the two sources ought to agree reasonably well, there is no guarantee that the must agree.

The choice between User and Eligible cohorts involves both technical and policy considerations. On the one hand, the User count most clearly tracks the current IHS budget. It reflects actual care provided within IHS. On the other hand, focusing solely on the User population makes an important policy distinction: Analysis is limited only to those individuals who are currently able to access IHS services. This may be a disadvantage to areas with the lowest funding levels, if lack of access is due to a lack of funding for health care.

The LNF Workgroup noted two significant additional issues in the choice of user versus eligible count. In some cases, official IHS User counts do not reflect the total number of individuals who access the system, due to utilization by AI/AN population from outside of official IHS service areas. In addition, concentration on the user population might differentially affect areas relying on contract care. Whereas direct care systems may encourage higher use rates as a way of demonstrating workload, contract care systems generally were less eager to encourage use due to limited contract care dollars.

If the user data are to form the basis of the budget allocation, there may need to be deeper analysis of variations in the user population. For example, individuals qualify as users if they use any IHS service, including dental care. Yet, the proportion of users with any dental service varies nearly four-fold across areas, from a high of almost 60 percent in California to a low of just 15 percent in Tucson. Similarly, Aberdeen provides half again as many visits per user as Oklahoma. Variations in the user count data and in the mix and intensity of services may require additional investigation before substantial IHS funds are allocated based on these user count data.

Table 3-12: Users, Medical Visits, Dental Visits, and Dental Patients Per User

IHS Area	**Users per Eligible 1999**	Total Medical Visits 1995	Medical Visits Per User	Total Dental Services 1995	Dental Svcs Per User	Total Dental Patients 1995	Dental Svcs Per Dental Patient	**Dental Patients Per User**
ABERDEEN	**1.06**	682,588	6.5	260,207	2.5	37,575	6.9	**0.36**
ALASKA	**1.04**	659,661	6.0	236,986	2.2	28,728	8.2	**0.26**
ALBUQUERQUE	**1.04**	427,605	5.1	179,467	2.2	27,902	6.4	**0.34**
BEMIDJI	**1.01**	501,003	6.0	140,035	1.7	21,095	6.6	**0.25**
BILLINGS	**1.17**	456,072	6.9	148,477	2.2	21,094	7.0	**0.32**
CALIFORNIA	**0.51**	370,106	5.6	266,585	4.1	37,414	7.1	**0.57**
NASHVILLE	**0.53**	258,189	6.5	84,755	2.1	12,474	6.8	**0.31**
NAVAJO	**0.94**	917,333	4.5	334,812	1.6	47,792	7.0	**0.23**
OKLAHOMA	**0.95**	1,121,262	3.9	328,922	1.1	46,854	7.0	**0.16**
PHOENIX	**0.87**	642,419	5.1	218,090	1.7	31,521	6.9	**0.25**
PORTLAND	**0.56**	424,217	4.9	119,983	1.4	16,042	7.5	**0.19**
TUCSON	**0.77**	88,573	4.1	20,380	0.9	3,283	6.2	**0.15**

Source: Utilization statistics calculated from Regional Differences in Indian Health, 1997.

§4: SPREADSHEETS WITH STATE AND SERVICE UNIT DATA

This section of the report summarizes the information found in State and Service Unit-level spreadsheets that accompany this report. These spreadsheets (in Microsoft Excel format) provide as much of the basic data for the LNF calculation as could be included. In addition, the elements of the LNF calculation are shown in detail. Where data are not available, such IHS budget data for individual Service Units, data from higher levels of aggregation are repeated. Thus, IHS Area-level budget data are repeated across the service units within each area.

§5: REFERENCES

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